

What is claimed is:

1. A system for overcoming or preventing a vascular flow restriction, comprising:
  - a structural element dimensioned to be disposed within or about at least a portion of a vessel having a vascular flow restriction; and
  - a length of bio-lining disposed along the interior of said structural element.
2. The system of claim 1 and further, wherein said structural element comprises a stent or stent-like device having at least one of a generally tubular mesh construction, generally spiral construction, semi-arcuate construction, and a generally hinged construction.
3. The system of claim 1 and further, wherein said bio-lining comprises a lining material having characteristics which prevent or reduce the formation of vascular flow restrictions when deployed within a blood vessel.
4. The system of claim 1 and further, wherein said bio-lining comprises at least one of autologous vessel, tissue-engineered vessel, synthetic vessel, and a combination of at least two of autologous vessel, tissue-engineered vessel, and synthetic vessel.
5. The system of claim 1 and further, wherein at least one of said structural element and said bio-lining are equipped with a therapeutic agent capable of inhibiting at least one of smooth muscle cell proliferation and proliferation or migration of fibroblast cells.
6. The system of claim 5 and further, wherein said therapeutic agent comprises at least one of paclitaxel, camptothecin, colchicine and dexamethasone.
7. The system of claim 1 and further, wherein said structural element is at least one of self-expanding and balloon-expandable.

8. The system of claim 1 and further, wherein said structural element is constructed from at least one of biocompatible metal and biocompatible polymers or plastics.

5 9. The system of claim 8 and further, wherein said biocompatible metal comprises at least one of stainless steel, titanium, tungsten, tantalum, gold, platinum, cobalt, iridium, alloys thereof, and shape-memory alloys.

10. The system of claim 8 and further, wherein said from biocompatible polymers  
10 or plastics comprise at least one of polytetra-fluoroethylene (PTFE), polyamides, polyimides, silicones, acrylates, methacrylates, fluorinated polymers, homo-polymers, copolymers and polymer blends.

11. The system of claim 1 and further, wherein said bio-lining is adhered to said  
15 interior of said structural element via at least one of mechanical and adhesive coupling.

12. The system of claim 11 and further, wherein said mechanical coupling comprises at least one of sutures, barbed coupling members, ultrasonic welding,  
20 resistive heating and laser irradiation.

13. The system of claim 11 and further, wherein said adhesive coupling comprises at least one of fluorinated ethylene/propylene copolymers, perfluoroalkoxy fluoro-carbons, ethylene/tetrafluoroethylene copolymers, fluoroacrylates, and fluorinated  
25 polyvinyl ethers.

14. The system of claim 11 and further, wherein said adhesive coupling comprises at least one of UV-activated bio-glue and fibrin.

15. A method for overcoming or preventing a vascular flow restriction, comprising:

providing a structural element dimensioned to be disposed within or about at least a portion of a vessel having a vascular flow restriction; and

5 equipping said structural element with a length of bio-lining along the interior of said structural element.

16. The method of claim 15 and further, wherein said structural element comprises a stent or stent-like device having at least one of a generally tubular mesh construction, generally spiral construction, semi-arcuate construction, and a generally hinged construction.

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15 17. The method of claim 15 and further, wherein said bio-lining comprises a lining material having characteristics which prevent or reduce the formation of vascular flow restrictions when deployed within a blood vessel.

18. The method of claim 15 and further, wherein said bio-lining comprises at least one of autologous vessel, tissue-engineered vessel, synthetic vessel, and a combination of at least two of autologous vessel, tissue-engineered vessel, and synthetic vessel.

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25 19. The method of claim 15 and further, wherein at least one of said structural element and said bio-lining are equipped with a therapeutic agent capable of inhibiting at least one of smooth muscle cell proliferation and proliferation or migration of fibroblast cells.

20. The method of claim 19 and further, wherein said therapeutic agent comprises at least one of paclitaxel, camptothecin, colchicine and dexamethasone.

30 21. The method of claim 15 and further, wherein said structural element is at least one of self-expanding and balloon-expandable.

22. The method of claim 15 and further, wherein said structural element is constructed from at least one of biocompatible metal and biocompatible polymers or plastics.

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23. The method of claim 22 and further, wherein said biocompatible metal comprises at least one of stainless steel, titanium, tungsten, tantalum, gold, platinum, cobalt, iridium, alloys thereof, and shape-memory alloys.

10 24. The method of claim 22 and further, wherein said from biocompatible polymers or plastics comprise at least one of polytetra-fluoroethylene (PTFE), polyamides, polyimides, silicones, acrylates, methacrylates, fluorinated polymers, homo-polymers, copolymers and polymer blends.

15 25. The method of claim 15 and further, wherein said bio-lining is adhered to said interior of said structural element via at least one of mechanical and adhesive coupling.

20 26. The method of claim 25 and further, wherein said mechanical coupling comprises at least one of sutures, barbed coupling members, ultrasonic welding, resistive heating and laser irradiation.

25 27. The method of claim 25 and further, wherein said adhesive coupling comprises at least one of fluorinated ethylene/propylene copolymers, perfluoroalkoxy fluoro-carbons, ethylene/tetrafluoroethylene copolymers, fluoroacrylates, and fluorinated polyvinyl ethers.

28. The method of claim 25 and further, wherein said adhesive coupling comprises at least one of UV-activated bio-glue and fibrin.

29. A system for deploying a length of bio-lining within a structural element for the purpose of overcoming or preventing vascular flow restrictions, comprising:

an elongated element having a balloon capable of being selectively inflated and  
5 deflated, said balloon including a plurality of coupling members extending therefrom,  
wherein said balloon upon inflation will cause said coupling members to extend  
through said bio-lining and into said structural element.

10 30. The system of claim 29 and further, wherein said coupling members are disposed within recesses formed along the exterior of said balloon.

15 31. The system of claim 29 and further, wherein said coupling members are disposed in at least one of rows, spiral, criss-cross, and random fashion on said balloon.

20 32. The system of claim 29 and further, wherein said coupling members are comprised of at least one of polytetrafluoroethylene, stainless steel, polyamides, polyimides, silicones, acrylates, methacrylates, fluorinated polymers, homopolymers, copolymers, polymer blends, and bio-degradable material.

25 33. The system of claim 29 and further, wherein said elongated element includes a

guide-wire lumen for passing a guide-wire through said elongated element.

34. A method of deploying a length of bio-lining within a structural element for  
25 the purpose of overcoming or preventing vascular flow restrictions, comprising:

providing an elongated element having a balloon capable of being selectively inflated and deflated, said balloon including a plurality of coupling members extending therefrom; and

30 inflating said balloon to cause said coupling members to extend through said bio-lining and into said structural element.

35. The method of claim 34 and further, wherein said coupling members are disposed within recesses formed along the exterior of said balloon.

5 36. The method of claim 34 and further, wherein said coupling members are disposed in at least one of rows, spiral, criss-cross, and random fashion on said balloon.

10 37. The method of claim 34 and further, wherein said coupling members are comprised of at least one of polytetrafluoroethylene, stainless steel, polyamides, polyimides, silicones, acrylates, methacrylates, fluorinated polymers, homopolymers, copolymers, polymer blends, and bio-degradable material.

15 38. The method of claim 34 and further, wherein said elongated element includes a guide-wire lumen for passing a guide-wire through said elongated element.

39. A system for harvesting a length of autologous vessel from a patient, comprising:

20 an elongated element having an interior dimensioned to be advanced over a length of autologous vessel; and

a cutting element disposed at a distal end of said elongated element, said cutting element configured to extricate the exterior of said length of autologous vessel from surrounding tissue such that said extricated autologous vessel may thereafter be cut and removed from said patient.

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40. The system of claim 39 and further, including an introducer dimensioned to be passed into said length of autologous vessel, wherein said elongated element is dimensioned to be advanced over said introducer to extricate the exterior of said length of autologous vessel from surrounding tissue.

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41. The system of claim 40 and further, including a dilator dimensioned to be positioned within said introducer to dilate an opening formed in said autologous vessel and thereby facilitate passage of said introducer into said autologous vessel.

5 42. The system of claim 41 and further, including a guide-wire dimensioned to be passed through said dilator to facilitate advancement of at least one of said introducer and said dilator into said autologous vessel.

10 43. The system of claim 39 and further, wherein said extricated autologous vessel may be cut and removed from said patient via at least a mechanical cutting system and an electronic cutting system.

15 44. The system of claim 43 and further, wherein said mechanical cutting system comprises at least one of a second cutting system on said elongated element, surgical scissors, and an anvil-type cutting system comprising an anvil member capable of being introduced into said autologous vessel and advanced into abutting relation with said cutting element to sever a distal end of said autologous vessel.

20 45. The system of claim 44 and further, wherein said second cutting system comprises at least one cutting element hingedly coupled to said elongated element and configured to cut a distal end of said autologous vessel.

46. The system of claim 39 and further, comprising:  
a system for holding said autologous vessel at least one of before, during and  
25 after said autologous vessel is extricated from said surrounding tissue, said holding system having an elongated element having a balloon capable of being selectively inflated and deflated, said balloon including a plurality of coupling members extending therefrom, wherein said balloon upon inflation will cause said coupling members to extend at least one of into and through said autologous tissue.

47. The system of claim 46 and further, wherein said holding system includes a sheath capable of protecting said interior of said autologous vessel from said coupling members on said balloon during advancement of said balloon into said autologous vessel.

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48. The system of claim 39 and further, wherein said elongated element is generally cylindrical having at least one of a uniform diameter and a stepped diameter having a first diameter, a second diameter larger than said first diameter, and a tapered region extending between said first and second diameter.

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49. The system of claim 48 and further, wherein said cutting element extends generally longitudinally away from said first diameter of said elongated element.

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50. A method for harvesting a length of autologous vessel from a patient, comprising:

providing an elongated element having an interior dimensioned to be advanced over a length of autologous vessel, and a cutting element disposed at a distal end of said elongated element;

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advancing said elongated element over a length of autologous vessel such that said cutting element extricates the exterior of said length of autologous vessel from surrounding tissue; and

removing said extricated autologous vessel from said patient.

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51. The method of claim 50 and further, including providing an introducer dimensioned to be passed into said length of autologous vessel, wherein said elongated element is dimensioned to be advanced over said introducer to extricate the exterior of said length of autologous vessel from surrounding tissue.

52. The method of claim 51 and further, including providing a dilator dimensioned to be positioned within said introducer to dilate an opening formed in said autologous vessel and thereby facilitate passage of said introducer into said autologous vessel.

5 53. The method of claim 52 and further, including providing a guide-wire dimensioned to be passed through said dilator to facilitate advancement of at least one of said introducer and said dilator into said autologous vessel.

10 54. The method of claim 50 and further, wherein said step of removing may be accomplished by cutting said autologous vessel via at least a mechanical cutting system and an electronic cutting system.

15 55. The method of claim 54 and further, wherein said mechanical cutting system comprises at least one of a second cutting system on said elongated element, surgical scissors, and an anvil-type cutting system comprising an anvil member capable of being introduced into said autologous vessel and advanced into abutting relation with said cutting element to sever a distal end of said autologous vessel.

20 56. The method of claim 55 and further, wherein said second cutting system comprises at least one cutting element hingedly coupled to said elongated element and configured to cut a distal end of said autologous vessel.

25 57. The method of claim 50 and further, comprising the step of:  
providing a system for holding said autologous vessel at least one of before,  
during and after said autologous vessel is extricated from said surrounding tissue, said holding system having an elongated element having a balloon capable of being selectively inflated and deflated, said balloon including a plurality of coupling members extending therefrom; and  
30 inflating said balloon to cause said coupling members to extend at least one of into and through said autologous tissue.

58. The method of claim 57 and further, wherein said step of providing said holding system includes providing a sheath capable of protecting said interior of said autologous vessel from said coupling members on said balloon during advancement of  
5 said balloon into said autologous vessel.

59. The method of claim 50 and further, wherein said elongated element is generally cylindrical having at least one of a uniform diameter and a stepped diameter having a first diameter, a second diameter larger than said first diameter, and a tapered  
10 region extending between said first and second diameter.  
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60. The method of claim 59 and further, wherein said cutting element extends generally longitudinally away from said first diameter of said elongated element.

15 61. A system for overcoming or preventing vascular flow restrictions within a vessel of a patient, comprising:

a length of bio-lining having first and second ends and an interior lumen extending therebetween; and

20 first and second structural elements coupled to said first and second ends of said bio-lining, said structural elements capable of being deployed within said vessel to establish a flow path through said interior lumen of said bio-lining.

62. The system of claim 61 and further, wherein the bio-lining isolates a portion of the interior lumen of the vessel from the flow of blood therethrough.

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63. The system of claim 61 and further, wherein at least one of the first and second structural elements is deployable via self-expansion or forced-expansion.

30 64. The system of claim 61 and further, wherein said first and second structural elements are deployable via forced-expansion, and wherein said bio-lining and said

first and second structural elements are delivered into the vessel via a deployment assembly.

65. The system of claim 64 and further, wherein the deployment assembly  
5 comprises a handle having a retractable snare member extending therefrom, said  
retractable snare member being capable of selectively constricting at least one of said  
first and second structural elements to reduce their diameter during introduction into  
said vessel and thereafter releasing said first and second structural elements within  
said vessel.

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66. The system of claim 61 and further, comprising:  
a second length of bio-lining having first and second ends and an interior  
lumen extending therebetween; and  
third and fourth structural elements coupled to said first and second ends of  
15 said second bio-lining, said third and fourth structural elements capable of being  
deployed within said vessel to establish a flow path through said interior lumen of said  
bio-lining.

67. The system of claim 66 and further, wherein said first structural element is  
20 deployed at a first location within said vessel, said third structural element is deployed  
at a second location within said vessel, and said second and fourth structural elements  
are coupled together at a third location within said vessel.

68. The system of claim 67 and further, wherein said first and third structural  
25 elements are self-expandable.

69. The system of claim 67 and further, wherein said second and third structural  
elements are mechanically coupled together via at least one of a lap-joint connector  
and a butt-joint connector.

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70. A method for overcoming or preventing vascular flow restrictions within a vessel of a patient, comprising:

providing a length of bio-lining having first and second ends and an interior lumen extending therebetween;

5 coupling first and second structural elements to said first and second ends of said bio-lining; and

deploying said first and second structural elements within said vessel to establish a flow path through said interior lumen of said bio-lining.

10 71. The method of claim 70 and further, wherein the bio-lining isolates a portion of the interior lumen of the vessel from the flow of blood therethrough.

72. The method of claim 70 and further, wherein at least one of the first and second structural elements is deployable via self-expansion or forced-expansion.

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73. The method of claim 70 and further, wherein said first and second structural elements are deployable via forced-expansion, and wherein said bio-lining and said first and second structural elements are delivered into the vessel via a deployment assembly.

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74. The method of claim 73 and further, wherein the deployment assembly comprises a handle having a retractable snare member extending therefrom, said retractable snare member being capable of selectively constricting at least one of said first and second structural elements to reduce their diameter during introduction into said vessel and thereafter releasing said first and second structural elements within said vessel.

75. The method of claim 70 and further, comprising:

providing a second length of bio-lining having first and second ends and an  
30 interior lumen extending therebetween; and

coupling third and fourth structural elements to said first and second ends of said second bio-lining; and

deploying said third and fourth structural elements within said vessel to establish a flow path through said interior lumen of said second bio-lining.

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76. The method of claim 75 and further, wherein said first structural element is deployed at a first location within said vessel, said third structural element is deployed at a second location within said vessel, and said second and fourth structural elements are coupled together at a third location within said vessel.

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77. The method of claim 76 and further, wherein said first and third structural elements are self-expandable.

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78. The method of claim 76 and further, wherein said second and third structural elements are mechanically coupled together via at least one of a lap-joint connector and a butt-joint connector.